A CANTILEVERED WIRE-WEIGHT WATER LEVEL GAGE

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A CANTILEVERED WIRE-WEIGHT WATER LEVEL GAGE[1]

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This report contains a description of a cantilevered wire-weight water level gage used by the Southern Plains Watershed Research Center at Chickasha, Okla. The gage was devised to obtain a direct reading of surface water level in a stream where the installation of a staff gage would be difficult or costly.

A direct reading gage, independent of any other device for measuring water level in a stream, is required at all surface water gaging stations. The gage provides the true water level reading for calibrating or setting other measuring devices. The gage is used with a float-operated instrument to determine if the water level in the gage well corresponds with the water level in the stream. Where a bubbler servomanometer is employed, the gage provides the direct water level reading for setting the recorder; or, the gage can serve as the sole water level measuring instrument at a gaging station.

If there is a bridge at the gaging site, a U.S. Geological Survey type-A wire-weight gage or a "reversed tape" set so the water level can be read directly at a reference point, can be installed. If no bridge is present, the wire-weight gage cannot be used, and a vertical or inclined staff gage is usually employed. However, both vertical and inclined staff gages have the following disadvantages:

1. The gage is difficult to read precisely except in still water.
2. It may be dislocated or completely removed from its anchorage by the action of water and debris.
3. The staff gage is often lifted by the formation of ice.

Although the inclined staff gage may not be as subject to disturbance by debris as the vertical staff gage, it may promote bank erosion. Also, the scale of an inclined staff gage varies with the slope of the bank upon which it is mounted; therefore, it must be custom made at a greater cost than that of a vertical staff gage.

There was no bridge at the West Bitter Creek gaging station; therefore, another method which would be free of the staff gage problems was devised to obtain the outside water level reading. The solution was to use a long boom extending horizontally from supports on the bank to a point over the stream. This boom permits placing the contact weight on the water surface of the stream while operating the tape reel from a convenient position on the bank. The general arrangement is shown on figure 1.

The details of the cantilevered wire-weight gage are shown on figure 2. The two supports are 2-1/2- by 2-1/2- by 3/16-inch angle irons cross-braced by 3/8-inch malleable iron rods. All joints are welded. The legs extend 5 feet into the ground and are each anchored by a cylinder of concrete 3 feet long and 2 feet in diameter.

The boom is sufficiently long to reach past the low-water line. In this particular installation, the overall length is 32 feet. A 1-1/2-inch steel pipe with a 1/4-inch wall thickness extends through the center of the boom. The boom truss rods are 5/8-inch malleable iron. Each truss

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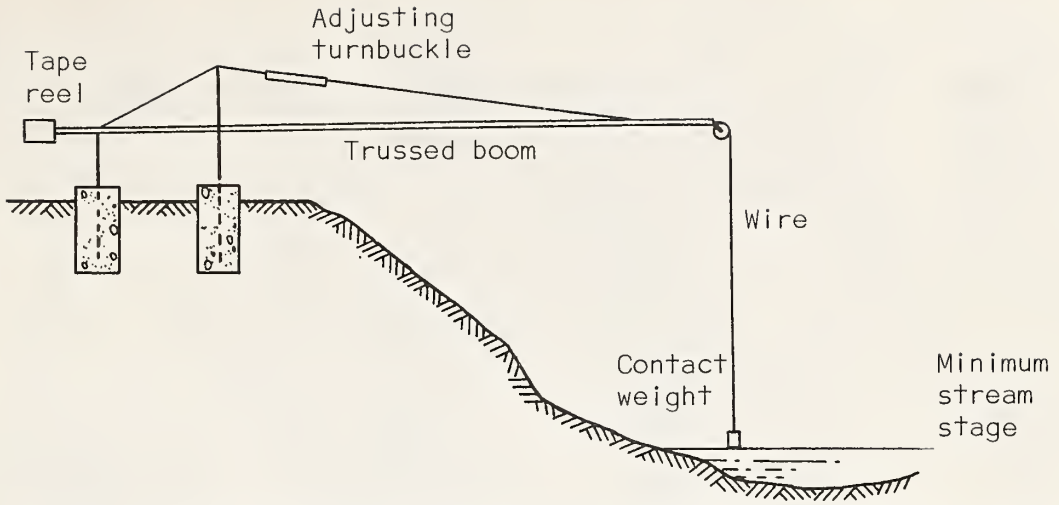

Figure 1.--The cantilevered wire-weight gage. The supports are out of the channel, yet the long boom reaches to a point over the water.

rod includes a turnbuckle to permit adjustment of the outer end of the boom to the correct elevation. Temperature changes and ice loading might cause distortion of the boom; therefore, sights were included so that boom distortion might be detected. The sights consist of a peep sight on the back support, a front sight on the front support, and a ball target on the stream end of the boom. When the three sights are alined, the outer end of the boom is at the correct elevation. The peep sight and front sight are black to reduce glare. The ball target is bright orange.

The weight, a 5-pound lead cylinder, is sufficiently large to prevent slack in the tape. When the weight is in the "up" position, nearly all of the tape is wound on the reel, which is enclosed in a metal box at the back of the boom. The pipe in the center of the boom encloses the tape and also provides the reference point for reading the tape. The remainder of the line, which extends from the tape to the weight, is lightweight aircraft cable. This lightweight cable is less subject to wind resistance and fluttering than a tape. Use of the cable reduces the amount of inaccurate gage readings.

An experimental gage similar to the design shown on figure 2 has been in use by the Southern Plains Watershed Research Center at the West Bitter Creek gaging station for 2 years. Adjustment of the gage has been necessary only once because of slight damage that occurred during a severe windstorm. The gage adjustment was not affected by the bank slumping that occurred during one rise to almost bankfull stage.

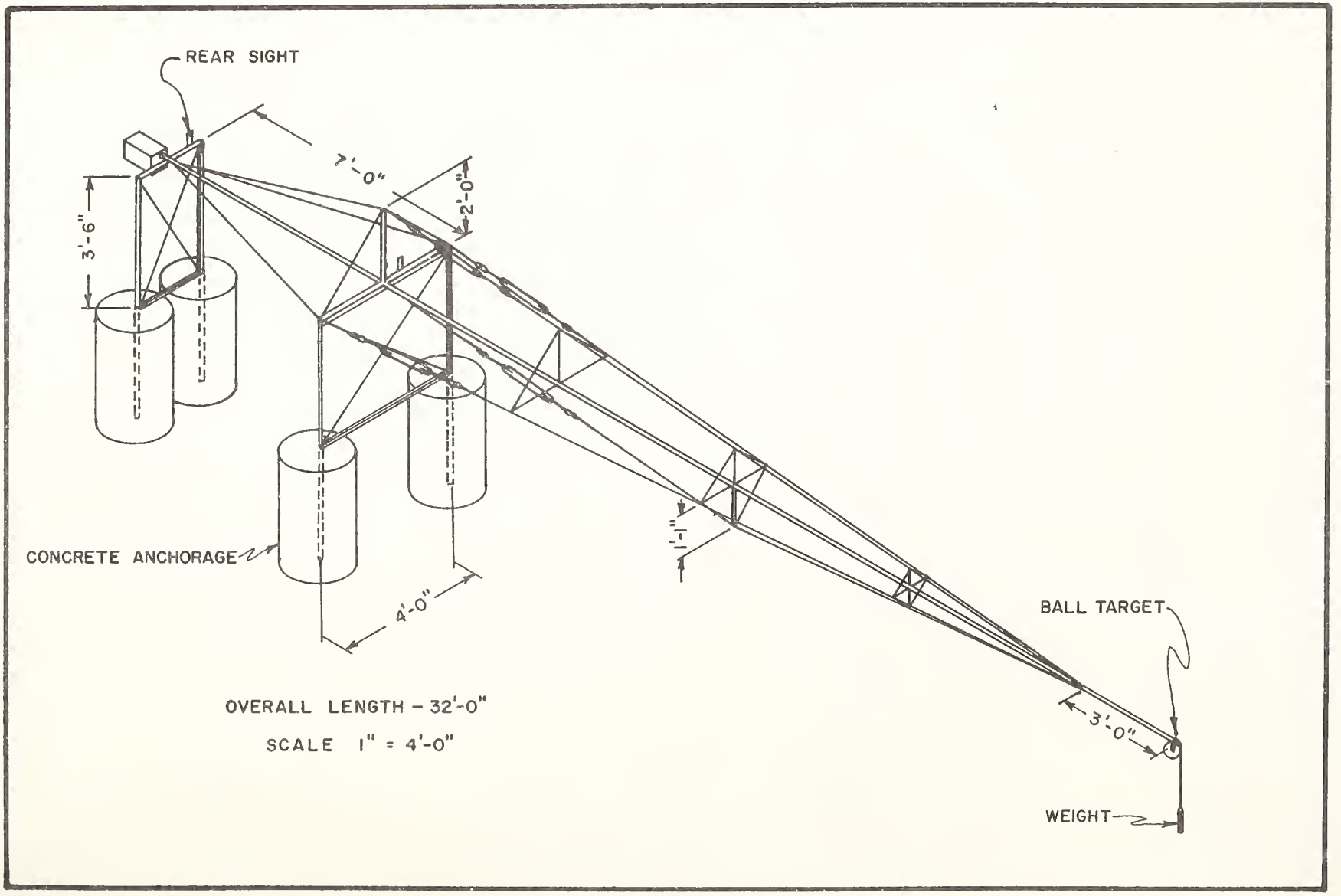

Figure 2.--Self-supporting wire-weight gage.